

WASHINGTON

# SCIENCE TRENDS

HIGHLIGHTS

- \* National Science Foundation
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## National Science Foundation

House and Senate have agreed on a cut of close to \$6 million in appropriations for the National Science Foundation. Nevertheless, existing programs in support of science education and basic research will be continued and, in many cases expanded, during the coming year.

Here is a summary of programs and projects which have been in controversy:

\* Southern Hemisphere Astrograph -- For the second time, the lawmakers have refused to appropriate any part of an \$800,000 request for funds to construct an astrograph - a telescope-type device used for accurate photographing of large areas of the sky. The building and equipment had been planned for Australia or South America. The astrograph was to have been given to Yale and Columbia Universities. The institutions were expected to guarantee to assume all operating costs for at least eight years.

\* National Atmospheric Research Institute - The Senate insisted on restoring the \$500,000 deleted by the House for a "feasibility" survey for a new institute to be operated by a group of universities interested in basic atmospheric studies. The universities have already submitted an elaborate report detailing such items as the type of floor tile and the number of gardeners required. Now they will have funds to determine whether such a project is feasible.

\* Weather Modification - The Senate won out on its demand that \$2 million be allocated for a new program of basic research in cloud physics and seeding and other weather modification problems. Previously, this program had to compete for grants against other physical science projects.

\* University Laboratories - The lawmakers approved a \$2 million start on a new program to equip and renovate existing graduate-level research laboratories in the natural sciences and engineering. The program, which is likely to mushroom in coming years, will be administered on an "experimental" basis with the universities putting up matching funds on at least a 50-50 basis.

Oceanography - This is becoming a popular subject with the lawmakers - particularly those from coastal areas. Without too much trouble, they approved \$2 million for construction of a new 140-foot vessel for basic research to be operated by Woods Hole Oceanographic Institute or a similar group..

### Special Report - Fuel Cell R&D

Military and allied research agencies are focussing increased attention on development of a practical and economic fuel cell - an electro-chemical device which produces energy from chemical reaction. These devices have the primary advantage of eliminating the requirement for heat, thereby greatly increasing theoretical operating efficiency.

The Army Research Office, in a new study, concludes that such devices hold great promise although an expanded laboratory effort is required to perfect devices competitive with present power sources.

Future emphasis, the Army believes, should be on continued research "rather than the immediate production of devices which, on the basis of present progress, will surely be found wanting in many respects."

Here, for reference is how the Army envisions the future military advantages and disadvantages of fuel cells:

#### Advantages

- \* Logistics: One of the major problems faced by the military services is in the supply of fuels to maintain adequate power generation. More efficient utilization than is now possible is urgently needed, and results obtained thus far reveal promise of practical achievement.
- \* Detection: Absence of the usual products of chemical reaction, noise, excessive heat generation, or any other quality capable of detection. Systems under investigation at present yield such combustion products as water and carbon dioxide, which cannot easily be traced as to source. In addition, the low temperature operation found in certain systems eliminates the problem of infra-red detection.
- \* Maintenance: It is regarded as certain that the reduction or complete elimination of moving parts in this device will make possible minimum care and attention. However, some systems will require pumping equipment and would be at a disadvantage in this respect.
- \* Compactness and Light Weight: High power-to-weight and power-to-volume ratios are especially necessary for units requiring transportation of any kind. The Army is encouraged by recent advances in the storage of fuels, and in the design and use of materials for various components.
- \* Versatility of Fuel Utilization: Several systems under development have demonstrated the ability to make use of different chemical substances as well as various energy sources to serve as fuels.
- \* Energy Storage: In the Army's view, a system can make a major contribution to military effectiveness if it produces not only power, but also reactants which are capable of conversion to power at a later time. Sources such as solar or nuclear energy might be stored in this manner through the generation of chemical products for use at a later date to produce electrical power through electrochemical combustion.

### New Technical Reports Available

Helium -- This report contains basic information on characteristics of helium-bearing natural gas, particularly phase relationship data showing the effect of processing a gas before or after gasoline removal. Entitled "An Experimental Study of the Phase Relationships of a Typical Helium Conservation Gas."

(Report available for inspection in file form at Bureau of Mines, Helium Plant, Amarillo, Tex; Office of the Assistant Director - Helium, Room 514 Barfield Building, Amarillo, Tex. and Helium Liaison Office, Room 4627, Interior Building, Washington 25, D.C.

Manganese -- The report covers the result of a technical study at the Pershing manganese mine, Aguache County, Colo. Includes information on diamond drilling and trenching and surface mineralization.

(Report available for inspection in file form at Division of Mineral Resources, Building 20, Denver Federal Center, Denver, Colo. and the Division of Minerals, U. S. Bureau of Mines, Interior Building, Washington, 25, D.C.

Saline Water -- These reports cover partial or inconclusive results of contract research on the problems of saline water conversion. They include:

- (1) Desalting of Water by Continuous Crystallization.
- (2) Design and Evaluation of Deep-Basin, Direct Solar-Heated Distiller for Demineralization of Saline Water.
- (3) Research on and Development of Ion-Selective and Ion-Specific Membranes for Use in the Large-Scale Low-Cost Demineralization of Saline Waters by Selective Electrodialysis.
- (4) New and Improved Methods for Lower Cost Solar Distillation.

(Reports available for inspection in file form at Office of Saline Water, Room 6639, Interior Building, Washington 25, D.C.

### Government Surplus Sales

\* Chromite Ore - U. S. will offer approximately 2050 long-tons of government-owned chromite ore and concentrates for sale in about six months. The offering will consist of both metallurgical and chemical types of low-grade ore of domestic origin.

\* Copan Tin Alloy -- Commercial users will soon have an opportunity to purchase 537 tons of Copan tin alloy produced from tin concentrates high in antimony and copper.

\* Calcined Alumina -- Some 6,000 short tons of calcined alumina will be offered for sale in approximately six months. The material is used primarily by smelters to produce aluminum but is also used in making such items as refractory bricks, cements, spark plugs, insulators, porcelain and glass mixes and ceramic ware.

(Details available from Mr. James O'Dwyer, Room 6038, General Services Administration Building, Washington 25, D.C.

## PUBLICATION CHECKLIST

- ( ) Product Development, a study for management of the means by which a new product can be developed and manufactured with increased profit and reduced cost and lead-time. 205 pages. \$3.50 (Write OTS, U.S. Department of Commerce, Washington 25, D.C. for PB 151 649, "A Modern Dynamic Approach to Product Development.")
- ( ) Mineral Exploration Program, a new pamphlet in question and answer form describing programs under which the U.S. Government will pay up to 50 percent of the cost of exploration when standard geochemical and geophysical methods are used. Free. (Write Office of Minerals Exploration, Department of The Interior, Washington 25, D.C. for Mineral Exploration Program)
- ( ) Information Retrieval, the latest in a series of Patent Office studies on the technical aspects of mechanized search and retrieval methods in information processing. Covers the subject "Prepositionals for Interrelational Concepts." 39 pages. Free. (Write Research and Development Office, The Commissioner of Patents, Washington 25, D.C. for R&D Report No. 16)
- ( ) Radioisotope Directory, the first volume of an international directory covering radioisotopes which are for sale or distribution by 59 major suppliers. Includes tables, physical data, lists of suppliers and a guide to safe handling. 264 pages. \$3.50. (Write International Atomic Energy Agency, Karntnerring 11, Vienna, 1, Austria for Vol. I - International Directory of Isotopes)
- ( ) Military Supply Management, statements, testimony and exhibits presented to Congress dealing with Pentagon supply policies and directives and the so-called Single Manager System of procurement. 695 pages. Single copies free. (Write Committee on Government Operations, U.S. House of Representatives, Washington 25, D.C. for Hearings - Military Supply)
- ( ) CBR Research, a report on plans, programs and policies in research dealing with Chemical, Biological and Radiological Weapons. Includes information on civilian application of U.S. Army Chemical Corps Developments. 37 pages. Single copies free. (Write Committee on Science and Astronautics, New House Office Building, Washington 25, D.C. for Report No. 23)
- ( ) Thermophysical Properties of Solid Materials, covers in tabular and chart form properties of pure elements, five groups of alloys, ceramics including glasses, cermets, intermetallics, polymeric materials including plastics and composite materials. Designed for use in connection with missile, aircraft and power plant engineering. 430 pages. \$6. (Write OTS, U.S. Department of Commerce, Washington 25, D.C. for PB 151 715)
- ( ) Alloys, a new report describing work done to develop a bath from which tin-nickel alloy plate could be deposited and found to be less corrosive than other methods tested. 11 pages. Free. (Write Publication-Distribution Section, U.S. Bureau of Mines, 4800 Forbes Avenue, Pittsburgh 13, Pa. for Report of Investigation No. 5482)

### Possible Disadvantages

- \* Direct Current: Electrical power generated from a fuel cell is limited to direct current and additional equipment is required for conversion to ac power.
- \* Power Limitation: At present, it does not appear possible to use fuel cells to generate large amounts of power over short time spans such as 10 hours or so, while achieving high power-to-weight and power-to-volume ratios. Therefore, certain batteries, such as the silver-zinc systems, are in a far superior position to meet such requirements.
- \* Auxiliary Equipment: In some of the systems under development large amounts of auxiliary equipment appear to be necessary for proper operation.

As the Army sees it, not all fuel systems will incorporate all of the listed advantages. However, it may be possible to disregard certain factors in favor of others. For example, efficient fuel utilization may be stressed for a large, permanent and well-protected power station where such factors as detection, design and ruggedness would not be of prime importance.

### Design Categories

Large-Central Station Type Plants: For generation of power in the 500 kw and above area, the Army study indicates that the Molten Salt fuel cell presently promises to make use of chemical fuels which best meet the requirements of availability and cost. The so-called Redox cell, designed to operate on a wide variety of fuels, may also meet such requirements. It is believed that where the fuel source is non-chemical a regenerative system employing nuclear or solar energies might be best.

Medium Power - Vehicular Propulsion: Studies indicate that in the 50-500 kw range many more factors must be taken into consideration such as long shelf-life, silence, fuel versatility and compactness. Hydrogen-oxygen systems appear to merit consideration for this purpose, while under special circumstances the use of Regenerative and Consumable Electrode types may be justified.

Small Systems: Fuel cells below 50 kw for certain communication and portable pack applications must include most of the advantages listed above. In addition, the Army believes that careful thought must be given to the time parameter -- the period of operation where optimum conditions, such as energy to weight ratios, are in effect.

(The Army is interested in receiving further information on fuel cell progress in industry. Write Research Analysis Division, Army Research Office, Chief of Research and Development, Department of the Army, Washington 25, D.C.)

## RESEARCH CHECKLIST

- ( ) Titanium Refining: Studies by the U.S. Bureau of Mines indicate that internal heating of a cell used in electrorefining titanium is practical and offers several advantages over externally heated designs. The new technique operates with greater efficiency, eliminates scaling and provides simplified construction.

(Report available. Single copies free. Write Publication-Distribution Section, U.S. Bureau of Mines, 4800 Forbes Avenue, Pittsburgh 13, Pa. for Report of Investigations No. 5494)

- ( ) Periscope Defroster: Navy is installing new defrosting equipment for submarine applications. Submarine attack periscopes have a heated window at the head. Interior surface of the glass has a new transparent silica and tin oxide coating through which an electric current is fed. Radar search periscopes are kept unfogged by a hot air jet against the outside of the head window. It was found that light transmission loss through a transparent metallic coating would not be desirable for night operations.

(R&D by Naval Research Laboratory and Navy Bureau of Ships, Washington, 25, D.C.)

- ( ) Free Radical Research: National Bureau of Standards has made extensive spectroscopic study of highly reactive atoms and excited molecules trapped in solids at low temperatures. Much information concerning free radicals at low temperatures has been obtained but many effects are said to be left unexplained at the present time.

(Report available. Free. Write Office of Technical Information, National Bureau of Standards, Washington 25, D.C. for Summary Technical Report No. 2377)

- ( ) DDT Research: Agriculture Department scientists, using radioactive tracers, have found that DDT showed a "surprising" evaporation rate in water and tends to cling to the walls and bottoms of containers when in solution. The finding is expected to lead to new techniques in utilization of this common insecticide.

(Some details available. Free. Write Service Department, Washington SCIENCE TRENDS, 1120 National Press Building, Washington 4, D.C.)

- ( ) Underwater Log System: Navy is now installing a new electromagnetic underwater log system said to be capable of measuring, indicating and transmitting speed and distance data relative to water. The so-called Litton Log System consists of a rodmeter, indicator - transmitter and sea valve. The insulated sensing unit of the rodmeter houses an electromagnet that generates a magnetic field in the surrounding water. Pickup buttons sense the voltage induced by the movement of the magnetic field through the water.

- ( ) Military Color Television: Air Force has developed a color television system said to be superior for general military applications and suitable for use with or without optical amplification. A tri-color reproduction tube can be combined with either a two or three-color system and can be readily incorporated into a storage optical amplifier system.

(Report available. 12 pages. 50 cents. Order PB 151 586 from OTS, U.S. Department of Commerce, Washington 25, D.C.)

